

whole they are rather narrower than the interspaces. The transverse markings are more of the nature of lamellae than the revolving ones and are more closely arranged. They trend slightly backward from the suture and take on a more distinct retral curve as they near the carina. The points of intersection with the revolving lirae are marked by fine nodes. For a certain distance below the carina the revolving lirae are rather crowded because of small secondary lirae developed in the interspaces but toward the umbilicus they become somewhat larger and more uniform in size as well as more loosely arranged. The transverse lines are distinctly finer, fainter, and more closely spaced than those above the carina. Their course is doubly sinuate. Swinging strongly forward from the carina they shortly change direction so as to make a broad low arch; this is followed by a broad shallow sinus which in turn is replaced near the axis, by a backward curve.

The carina is formed by the slit band which is inclosed between two sharp edges or lamellae that distinctly define it. The band itself, however, is prominent, projecting beyond the bounding lamellae. It is conspicuously marked by strong, regular lunettes and also by revolving lirae, two in number, that are interrupted by the lunettes and appear only as two rows of small nodes connected by more or less obscure raised lines.

W. tenuilineata appears to be more nearly related to the common Pennsylvanian *W. tabulata* than to any Mississippian species that have been referred under *Worthenia*. In *W. tabulata*, however, the spire is more strongly turreted, the lateral surface is sharply defined by an angle from the lower, and the sculpture, especially that on the lower part of the volutions, is much coarser.

Horizon and locality: Fayetteville shale; Eureka Springs quadrangle, S. E. $\frac{1}{4}$ sec. 15, T 16 N, R 27W., Ark.

PALEONTOLOGY.—*Two new species of "Orthophragmina" from Calita Sal, Peru.*¹ WILLARD BERRY Johns Hopkins University.
(Communicated by JOHN B. REESIDE, JR.)

In 1928 I assigned a new species of "*Orthophragmina*" to a new subgenus *Asterodiscocyliina*.² Since that time other material from the same locality has yielded two more new species of "*Orthophragmina*," which are described in this paper. Many specimens of *Asterodiscocyliina stewarti* W. Berry were also included; several specimens of *Liothyina peruviana* of Olsson, who says that it is found in the Saman Conglomerate near Organo Grande and Quebrada Canoas, Department of Piura, Peru; and "*Orthophragmina*" *peruviana* Cushman, which is found in the Eocene at the horizon of the Saman Conglomerate. Tobler lists "*Orthophragmina*" *asteriscus* Guppy from a locality just south of Calita Sal at Punta Sal.³ I have examined my material

¹ Received March 1, 1929.

² WILLARD BERRY. *Asterodiscocyliina*, a new subgenus of *Orthophragmina*. *Eclogae geol. Helvetiae* 21 (2). 1928.

³ A. TOBLER. *Neue Funde von obereocänen Grossforaminiferen in der nordperuischen Küstenregion*. *Eclogae geol. Helvetiae* 20. 1927.

with a great deal of care and have failed to find any four-rayed species, but have found some small portions of six-rayed forms broken so as to resemble a badly preserved, possibly four-rayed form. On the basis of the associated fossils the beds containing the material here described are correlated with the Saman Conglomerate as described by Olsson and Iddings,⁴ and by Olsson.⁵

The two species may be described as follows:

“*Orthophragmina*” (*Discocyliina*) *salensis*, W. Berry, n. sp.

Figs. 1, 2

Test large, very thin, umbonate; diameter 5 to 9 mm., thickness 0.7 mm., ratio of diameter to thickness 13- to 1; small central boss 1 mm. in diameter, flange about 4 mm. in diameter. Surface covered with small papillae about 78 microns in diameter at the surface. Surface diameter of the lateral chambers 27.3 microns.

In equatorial section the nucleocoenoch composed of two chambers, the initial chamber 136.5 microns in diameter and half surrounded by the second chamber; diameter of the entire nucleocoenoch 292.5 microns, the walls of the nucleocoenoch very thin, being only about 7.8 microns thick. At about 1 mm. from the center the equatorial chambers of typical rectangular “*Orthophragmina*” shape, 35.1 microns in radial diameter, 19.5 microns in tangential diameter, with walls 5.7 microns thick; at the periphery, 78 microns in radial diameter, 15.6 microns in tangential diameter, with walls 7.8 microns thick; these chambers arranged in circles.

In vertical section the wall between the equatorial chambers and the lateral chambers 15.6 microns thick. Vertical diameter of the equatorial chambers 20 microns at the center of the test and constant to the periphery. Vertical diameter of the lateral chambers 82 microns near the central part of the test; thickness of the horizontal walls 35 microns. There are 15 lateral chambers on the sides of the equatorial layer near the center of the test.

Occurrence: In a grayish-brown, calcareous, gritty sandstone exposed near Calita Sal, Department of Piura, Peru. Associated with “*Orthophragmina*” (*Asterodiscocyliina*) *stewarti* W. Berry, “*Orthophragmina*” (*Discocyliina*) *peruviana* Cushman and “*Orthophragmina*” (*Asteriacites*) *calita* W. Berry.

This species looks very much like *O. Clarki* Cushman and *O. pratti* Michelin but differs in having all the papillae the same size. It differs from *O. peruviana* in being very much thinner in proportion to the diameter. The paper-thinness of the test and the small, raised boss permit it to be easily recognized.

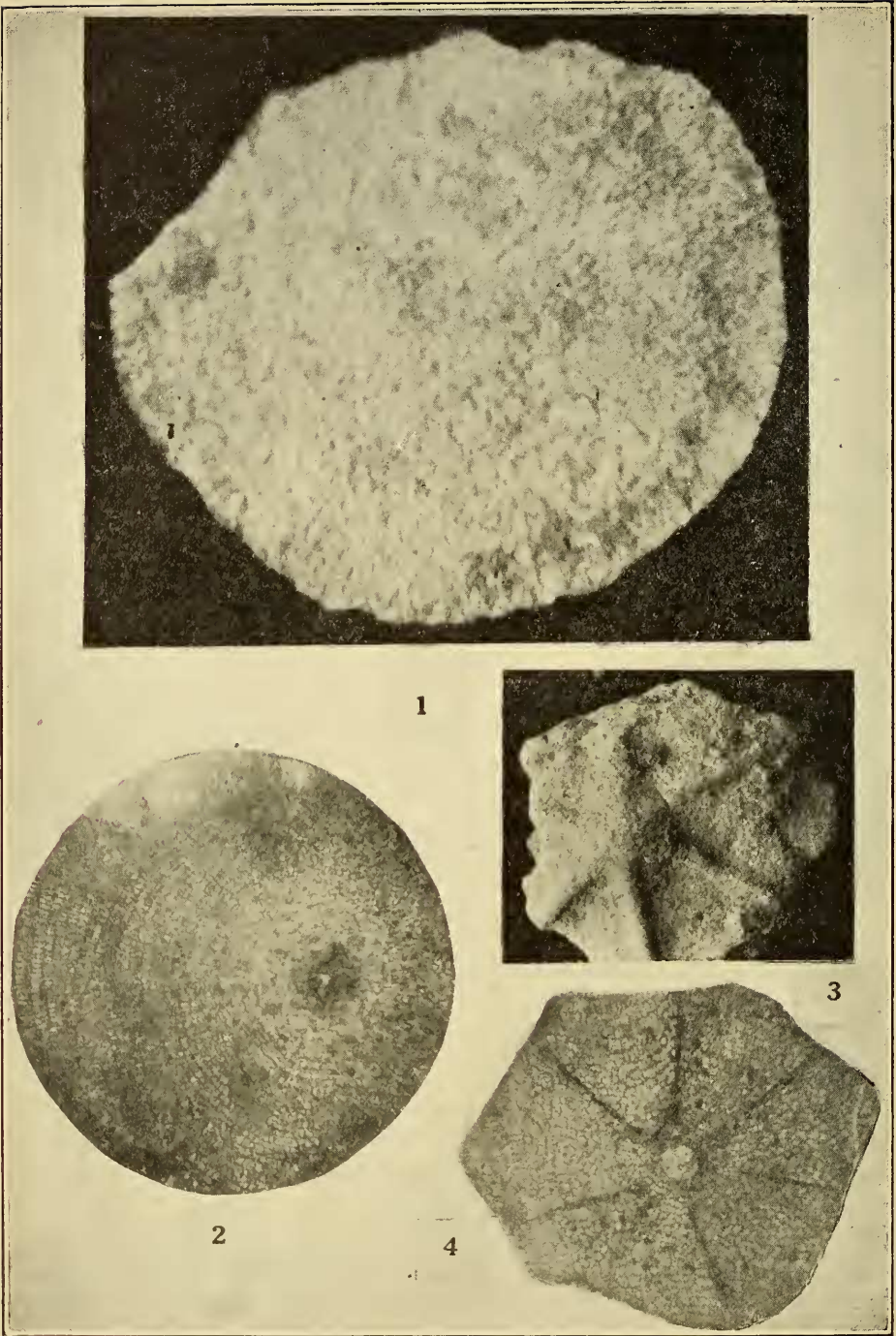
“*Orthophragmina*” (*Asteriacites*) *calita* W. Berry, n. sp.

Figs. 3, 4

Test medium, thin, stellate, typically six-rayed; rays connected evenly with the central boss; diameter from 4 to 6 mm., thickness 0.4 to 0.7 mm., ratio of diameter to thickness 8.6 to 1; central boss about 1.2 mm. in diameter, flange

⁴ A. A. OLSSON and A. IDDINGS. *Geology of northwest Peru*. Bull. Am. Assoc. Petr. Geol. 12. 1928.

⁵ A. A. OLSSON. *Contributions to the Tertiary paleontology of northern Peru, Pt. I, Eocene Mollusca and Brachiopoda*. Bull. Am. Pal. 14 (52). 1928.



Figs. 1, 2.—*Orthophragmina salensis* W. Berry, n. sp. 1, surface of test $\times 10$; 2, equatorial section $\times 20$.
 Figs. 3, 4.—*Orthophragmina calita* W. Berry, n. sp. 1, surface of test $\times 10$; 2, equatorial section $\times 20$.

2.3 mm. in diameter; rays fairly wide (0.4 mm.) and evenly curved or U-shaped; inter-ray areas level. Entire surface slightly reticulate; no evidence of any pillars. Surface diameter of the lateral chambers 78 microns.

In equatorial section; the nucleocoenoch composed of the initial chamber 109.2 microns in diameter, surrounded for about two thirds of its circumference by the second chamber; diameter of whole nucleocoenoch 218.4 microns, with walls 11 microns thick. Equatorial chambers normally rectangular, but elongated radially at seven places, giving rise to seven ray like series of chambers. Normal equatorial chambers at the center 31.2 microns in radial diameter, 19.5 microns in tangential diameter, with walls 9 microns thick; at the periphery, 46.8 microns in radial diameter, 19.5 microns in tangential diameter, with walls very thin, only 3 microns thick. Equatorial chambers of the "rays" at the center 46.8 microns in radial diameter, 19.5 microns in tangential diameter, with walls 7.8 microns thick; at the periphery, nearly the same size, 46.8 microns in radial diameter, 21 microns in tangential diameter, with walls 5.6 microns thick.

In vertical section the wall between the equatorial chambers and the lateral chambers 7.8 microns thick. Vertical diameter of the equatorial chambers 19 microns at the center of the test, increasing evenly to 43 microns in diameter at the periphery. Lateral chambers arranged in columns; vertical diameter 19 microns near the surface at the center of the test, the horizontal walls about 5 microns thick. There are a total of 18 lateral chambers on the sides of the equatorial layer near the center of the test.

Occurrence: In a grayish-brown, calcareous, gritty sandstone exposed near Calita Sal, Department of Piura, Peru. Associated with "*Orthophragmina*" (*Asterodiscocyliina*) *stewarti* W. Berry, "*Orthophragmina*" (*Discocyliina*) *peruviana* Cushman and "*Orthophragmina*" (*Discocyliina*) *salensis* W. Berry.

This species cannot be compared with any that I know of. Most of the described forms have the same number of interior and exterior "rays." In this species, however, there are constantly six surface "rays" and seven interior "rays." I have no sections of the six-rayed forms that do not show seven interior "rays."

PALEONTOLOGY.—*Two new larger Radiolaria from Peru.*¹ WIL-LARD BERRY, Johns Hopkins University. (Communicated by JOHN B. REESIDE, JR.)

The literature on fossil Radiolaria is relatively meager and predominantly relates to the smaller flask-shaped or conical forms of Nassellaria (Monopylaria) and Phaeodaria (Tripylaria). The discovery of two large related species belonging to the group which Haeckel christened Order Phaeosphaera is therefore of especial interest, not only because of their size but also because of their presence in large numbers in a shallow water deposit. The illustrations fall far short of doing justice to the exquisite beauty of the fossils, a beauty

¹ Received March 1, 1929.